on the grounds of utility English ought to be given an important place in the school curriculum, it is one of the most neglected subjects. The result is that few boys leaving school are able to write a good letter, and many adults are unable to describe things or events in precise terms. On this account many misleading statements are made which might have been avoided. Mr. Hartog pleaded for the rational and systematic teaching of the mother tongue in our schools. By neglecting this subject the teacher is deprived of a very powerful instrument of education. Prof. G. M. Minchin gave, in a paper, a number of examples of the misuse of common English words and expressions, among them being split infinitives, *without* instead of *unless*, misplaced *shall* and *will*, and many others which should be avoided by all who desire to use words in their correct sense and place, and preserve our language from barbarisms.

Other subjects were considered during the meetings of the Section, but limitations of space will not permit descriptions of them, or of the many valuable points brought forward by speakers in the discussions. It was evident from what was read and said that a large amount of material of interest to men of science and practical teachers is available, so the Section is likely to be even more active in the future than it has been during its two years of existence. R. A. G.

BOTANY AT THE BRITISH ASSOCIATION.

THE semi-popular lecture was given on Monday, September 15, by Prof. F. W. Oliver, on ancient and modern seeds. The lecturer gave a clear and interesting description, illustrated with lantern slides, of the gradual evolution of the seed, and dealt with some of the more interesting questions concerning the morphology of various seed structures.

On Friday, September 12, the botanists paid a visit to the Belfast Botanic Gardens, and under the guidance of the able curator, Mr. McKimm, inspected the extremely interesting fernery which has recently been constructed. On Tuesday afternoon, the Rev. C. H. Waddell, the indefatigable local secretary of Section K, conducted a botanical excursion to Colin Glen. After an interesting ramble, the members were entertained to tea by Mr. and Mrs. Kidd, whose kindness was much appreciated.

Much interest was taken in a collection of characteristic Australian plants, exhibited by Mr. Thomas Steel during the meeting.

Prof. I. Bayley Balfour, F.R.S., exhibited and described specimens of the various forms of *Erica tetralix* found in Connemara. Mr. James Stirling, Government Geologist of Victoria, in a paper on the flora of the Australian Alps, dealt with the origin and distribution of the mixed types of plants now growing on the highest altitudes over south-east Australia, and their correlation with other Alpine and the Tertiary floras of the region.

Mr. R. Lloyd Praeger read a paper on the composition of the flora of the north-east of Ireland. This area includes the counties of Down and Antrim, and the flora numbers 820 species of flowering plants and vascular cryptogams, the total flora of Ireland being reckoned at 1020 species. There is in the local flora an almost complete representation of British type plants. English type plants are rather poorly represented. Scottish type plants reach in Antrim their maximum for Ireland; in Down they are somewhat fewer. Of Highland type species there is a fair representation; Antrim, though of less elevation, contains more Alpine plants than Down. Germanic plants are extremely few in Ireland. In Atlantic type plants, Down and Antrim are comparatively rich.

Mr. Herbert Wright (Ceylon) contributed a paper on foliar periodicity in Ceylon, in which he showed that some trees undergo complete defoliation twice per year; others exhibit incremental foliar activity several times per year, in addition to a complete annual renewal. The irregularity of foliar periodicity is very pronounced. There is not a month when all the trees are in full leaf.

In the department of plant physiology, Prof. J. C. Bose, of Calcutta, gave an interesting demonstration, illustrated by experiments, on the response of plants to stimulation (*vide Journ.* Linn. Soc., xxxv., 1902). Mrs. D. H. Scott gave an account of the movements of the flower-buds and flowers of *Sparmannia africana* up to the time of the setting of the fruit. At first the buds hang all in one plane; each bud has a joint on the stalk, which is much swollen below the flower. The buds rise one by one from the drooping position to the horizontal; then make a sharp curve inwards, and just before flowering the bud hangs down in an exactly vertical position. The flowers open during sunlight at a temperature not below 60° F. (15°·5 C.), so that on a cold day perhaps only one flower and on a hot day three or four may be open at the same time. The flowers reopen for several days; during this time they gradually take up a vertical position, pollen often being formed for five or six days. Then, if fertilised by bees, the flower-stalk falls again into the horizontal position, from which it rises again as the fruit ripens. Mr. Barnard and Prof. Allan Macfadyen, in a paper on luminous bacteria, stated that these organisms require particular and exact conditions in order to exhibit their luminous properties. They must have a suitable nutrient soil containing such proportions of salts as shall render the medium isotonic. A supply of free oxygen is essential; in the absence of oxygen the organisms live, but are non-luminous. The luminosity appears to be due to the vital processes of the cell, and an exposure to the temperature of liquid air does not destroy it. Prof. Macfadyen and Mr. Rowland also contributed a paper on the suspension of life at low temperatures, in which they showed that ten hours' exposure to the temperature of liquid hydrogen (about − 252° C.) had no appreciable effect on the vitality of the various organisms (bacteria and yeast) tested. Miss Gabrielle L. C. Matthaei (Cambridge) described experiments on the effect of temperature on carbon dioxide assimilation in the leaves of the cherry laurel. The lowest temperature at which assimilation could be detected was − 6° C. This is the first well-established case of assimilation below 0° C. For temperatures between −6° C. and 33° C. it was found that assimilation is affected in exactly the same way as is respiration. Provided the illumination is sufficient, the assimilation increases with the temperature. Dr. Henry H. Dixon (Dublin) gave an account of some experiments made to determine the resistance of seeds to high temperatures. The maximum temperature to which the various seeds were exposed and still retained their germinating power varied from 90° C. to 121° C. The president communicated a paper by himself and Mr. H. Jackson on the germination of fatty seeds. In the case of Ricinus, the reserves consist mainly of oil and aleurone, hardly a trace of carbohydrate being present. In germination, the oil diminishes and both cane sugar and glucose make their appearance, accompanied by the formation of lecithin, a fatty body which contains nitrogen and phosphorus.

Several important papers on fossil plants were read. Miss Margaret Benson described the seed-like fructification of *Miadesmia membranacea*, Bertrand. The foliage leaf bears a ligule in a longitudinal groove with thickened base and sides. In the sporophylls, the sporangia are inserted singly in the proximal end of the groove, and are large and pedicellate. In the megasporophyll, the sides of the groove are completely coherent above the sporange, and thus form a velum. The wall of the megasporange is composed of several layers of isodiametric cells, and encloses a single thin-walled megaspore or embryo sac. The microsporange has no velum, and the wall is formed of a palisade layer. Miss Benson also described the structure of some sporangia found associated with petioles and other fragments of *Lyginodendron oldhamium*. Mr. Lomax described two specimens obtained from Dulesgate, which show that Lyginodendron had a branching stem; also that the branch was given off in the one case between two leaf-stalks and in close proximity to several roots. The position of the roots shows that they must have been aërial roots, and not, as generally accepted, basal or confined to the basal regions of the stem. Mr. Lomax also read a paper on the occurrence of nodular concretions (coal balls) in the Lower Coal-measures. These bodies consist of a quantity of fragments of short pieces of stems, &c., some with the cortex, some without, some split in fragments, and so on. From an examination of these nodules it appears that, at least in this case, these plant remains have not grown on the spot where we now find them, and the author comes to the conclusion that the various portions of plants have been carried into their present position after being broken in fragments, and before petrification, or they have been carried from a parent bed after petrification. In a paper on sporangiophores as a clue to affinities among Pteridophyta, Dr. D. H. Scott, F.R.S., pointed out that some years ago he suggested the probability of an homology between the ventral sporangiophores of Sphenophyllum or Cheirostrobus and the similarly placed synangia of

the Psiloteæ; on this ground, among others, an affinity between the fossil and the recent family appeared tenable. This view has recently been supported by Prof. Thomas, of Auckland, N.Z., on evidence drawn from certain remarkable variations which he observed in the genus Tmesipteris. On the view suggested, the synangium of the Psiloteæ is neither a reduced strobilus nor a septate sporangium, but a ventral sporangiophore bearing a variable number of sporangia, normally two or three, according to the genus. Mr. A. C. Seward, F.R.S., and Mr. Arber gave an account of some fossil Nipa seeds from Belgium.

In the domain of plant morphology, several interesting papers were communicated. Mr. John C. Willis, director of the Royal Botanic Gardens, Peradeniya, described the dorsiventrality of the Podostemaceæ, and showed that it extends both to the vegetative and floral organs. The more modified types show a progressive increase in dorsiventrality of the vegetative system followed throughout by an increase in that of the floral. The same series, regarded ecologically, shows that though the flowers are steadily more and more zygomorphic—a condition usually regarded as an adaptation to insect visits—we have here flowers which stand stiffly erect, and are more and more anemophilous and autogamous. Miss Sibille O. Ford (Cambridge) gave an account of the morphology of the Araucarieæ, which include the two genera Araucaria and Agathis; they are characterised by the regularity of their branching and the persistence of their leaves. The apex of the stem shows no definite apical cell, but a somewhat irregular dermatogen. Well-marked annual rings may be found in the wood, and bordered pits are found on the tangential walls of the latest formed summer wood. Mr. Herbert Wright (Ceylon) described the sex relationships in Ceylon species of Diospyros. These plants have hitherto been regarded as dicœcious, but he finds from an examination of fresh material frequent departures from this condition, some being monœcious, others dicœcious and polygamous, and others dicœcious, monœcious and polygamous. Mr. Worsdell gave an account of the various theories as to the nature of the sporangial integuments in various groups of plants. The author maintains Celakovsky's view that in the ferns the *soriferous segment of pinnule*, bearing as a rule sporangia on its lower (dorsal) surface, is the homologue of the outer integument of the ovule in Angiosperms, and *indusium* that of inner integument. Mr. Worsdell also read a paper on the nature of the vascular system of the stem in certain dicotyledonous orders, in which he comes to the conclusion, from anatomical data, that no hard and fast line exists between the two classes of dicotyledons and monocotyledons. The flowering stem and peduncle, as being those parts of the caulome which have undergone least modification owing to the necessities of adaptation to external conditions, exhibit, as a rule, most clearly the primitive structure which in the vegetative parts has become obscured. Mr. E. A. Newell Arber (Cambridge) read a paper on the morphology of the flowers in certain species of Lonicera. The genus includes about seventy species which belong to the section Xylosteum. In this section, the gynœcea of a two-flowered dichasium are more or less completely united together. In some cases, the two inferior ovaries are united in one plane by *the union of their receptacular walls*. In others they are for the most part free from one another, but surrounded by an outer parenchymatous tissue, arising from the base. This tissue is the result of the *fusion of the bracteoles* of the true flowers. Mr. Harold Wager communicated some of the results of his recent observations on the structure of the central body in various species of Cyanophyceæ which show that, although wanting some of the characteristics of the nuclei of higher organisms, it must be regarded as nuclear in character and possibly as a nucleus of a simple or rudimentary type. In another paper, Mr. Wager dealt with the function of the nucleolus. This body, in the cases examined by him, appears to be intimately connected with the nuclear network, and contains chromatin material which contributes directly to the formation of the chromosomes. Prof. Oliver and Miss Edith Chick had a paper on the morphology of *Torreya myristica*, in which some interesting features of morphological importance were described.

Among other papers brought before the Section were the following contributions from mycologists:—Miss Lorrain Smith described a disease of the gooseberry which attacks the hard stem of the bushes above and below the ground level. The inner bark is permeated and completely destroyed by the mycelium of a fungus. The outer bark cracks and splits, and sclerotia are formed on the outside or half embedded in the cortex. Mr. Barker (Cambridge) gave an account of the fungus of Samsu, a fermented drink of Eastern Asia, obtained by the distillation of a fermented liquor prepared from rice. The conversion of the starch into fermentable sugars is due largely to a species of Monascus. Hitherto this genus has been placed in the Hemiasci on account of a supposed formation of spores in a sporangium, surrounded by an investment of hyphæ. It is, however, one of the simplest sexual Ascomycetes. Mr. E. M. Freeman (Cambridge) contributed a paper on the darnel seed fungus, in which several new and important facts were brought forward. H. W.

CARLSBAD MEETING OF THE GERMAN ASSOCIATION OF NATURALISTS AND PHYSICIANS.

THE seventy-fourth annual meeting of the Association of German Naturalists and Physicians was held on September 21–28 at Carlsbad, after an interval of not less than forty years. At the meeting, very naturally, the hot springs for which the place is famous suggested a suitable subject for discussion. Geologists and chemists alike concentrated their attention upon them. Prof. van 't Hoff, who may be regarded as the veritable creator of modern theoretical and physical chemistry, was there to elucidate the subject. Prof. Meyerhofer applied the latest teaching of that particular science to the springs, exciting a keen interest by his masterly method of dealing with the subject, more particularly when entering into the newest discoveries with regard to the theory of osmotic pressure and of ions which van 't Hoff and Arrhenius have effectively established. The entire organism in biology may be shown to be a collection of osmotic cells, enclosing saline solutions, and the movement of liquids in them is to a high degree, if not entirely, determined by the laws of osmotic pressure.

The Carlsbad springs have been again and again subjected to osmotic analysis, and this has led to a considerably deeper insight into the cause of their hygienic action than the merely chemical analysis which had first been judged sufficient. Mineral waters of high osmotic pressure, so it has been ascertained, remain in the stomach longer than waters of low osmotic pressure, and this fact enables the physician the better to judge what kind of water should be selected in dealing with any particular affection of the stomach. The study of the waters has been carried further, and the value of certain distinct rules and modified methods has been ascertained as facilitating comparison in respect of osmotic pressure between mineral springs and liquids occurring in the human body. Among other results, it has been shown that natural mineral waters are much more efficacious than artificial imitations. Very possibly this is due to the presence in the natural springs of certain chemical substances held in solution in such infinitesimal quantities that make them escape the notice of the purely chemical analyst. Such undiscovered ingredients may very well act by catalytic methods and so increase the efficacy of the solution.

That question, indeed, requires further elucidation, which is likely to prove of much benefit to balneological science, to the relief of suffering humanity.

Another lecture of great interest was that delivered by Prof. Suess, of Vienna, on the nature of hot springs. The mineral springs which are due to infiltration from surface water go by the name of "vadose" springs; they may be either cold or hot, according to their depth. It has been proved in the case of more hot springs than one that they run along earth crevasses formed before their own origin. Thus at Carlsbad the springs have followed the preexisting metallic veins (ore-lodes) which thousands of years ago found an outlet from the interior to the surface. The Carlsbad springs yield yearly about 5·6 million kilogrammes of solid ingredients which originate in the interior of the earth and contain in correspondingly small quantities the same elements as the ore-lodes the course of which they follow. Carlsbad is therefore manifestly a "juvenile," *i.e.* volcanic, water. Attempts made to search for an area of infiltration (as for "vadose" waters) or to estimate the depth of its origin from any kind of a so-called thermal scale have proved absolutely futile. Nor yet can the presence of mineral ingredients be explained by the nature of the granite through which they run to the surface. The cavities which were long supposed to have been formed by the continual effusion of 5·88 million